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abroad. Another bristle mould is found on rotting grass; the *Eurotium herbariorum*, pesters our botanists by its presence in their collections of dried plants, and so wide is the geographical range of many kinds of smaller fungi, that no country and scarcely any latitude escapes their visitations.

The exquisite elegance of the spores of the fungi should suggest the dry and wet mounting of them in glass slides for the microscope. Entire plants and portions of others could be readily prepared, and the patience, enthusiasm, and skill of a Bicknell are all that are requisite for a beginning in this direction.

It is with extreme reluctance that we lay down this fascinating little treatise; its pages indeed may be read and re-read with constant profit. To this and to similar works, the botanist, the general enquirer, and the agriculturist are equally indebted, and well will it be for this country when the American press shall issue many and such as this.



A CHAPTER ON FLIES.

BY A. S. PACKARD, JR.



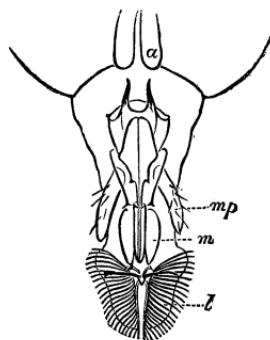
[Concluded from page 596.]

THE common House-fly, *Musca domestica* Linn., scarcely needs an introduction to any one of our readers, and its countenance is so well known to all that we need not present a portrait here. But a study of the proboscis of the fly reveals a wonderful adaptability of the mouth-parts of this insect to their uses. We have already noticed the most perfect condition of these parts as seen in the horse-fly. In the proboscis of the house-fly the hard parts are obsolete, and instead we have a fleshy tongue-like organ (Fig. 1), bent up underneath the head when at rest. The maxillæ are minute, and their palpi (*mp*) are single-jointed, and the mandibles

(*m*) are comparatively useless, being very short and small, compared with the lancet-like jaws of the mosquito or horse-fly. But the structure of the tongue itself (*labium, l*) is most curious. When the fly settles upon a lump of sugar or other sweet object, it unbends its tongue, extends it, and the broad knob-like end divides into two broad, flat, muscular leaves (*l*), which thus present a sucker-like surface, with which the fly laps up liquid sweets. These two leaves are supported upon a framework of tracheal tubes, which act as a set of springs to open and shut the muscular leaves. This framework of tracheæ does not seem to have been noticed in the books at hand while writing, Mr. Edward Bicknell having first called my attention to it. He has mounted specimens, previously treated with potash, for the microscope, in his unequalled style, which illustrate admirably the structure of the end of the proboscis. In the cut given above, Mr. Emerton has faithfully represented these modified tracheæ, which end in hairs projecting externally. Thus the inside of this broad fleshy expansion is rough like a rasp, and as Newport states, "is easily employed by the insect in scraping or tearing delicate surfaces. It is by means of this curious structure that the busy house-fly occasions much mischief to the covers of our books, by scraping off the albuminous polish, and leaving tracings of its depredations in the soiled and spotted appearance which it occasions on them. It is by means of these also that it teases us in the heat of summer, when it alights on the hand or face to sip the perspiration as it exudes from, and is condensed upon, the skin."

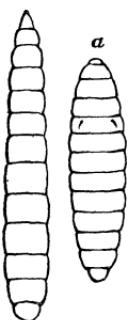
Every one notices that house-flies are most abundant around barns in August and September, and it is in the ordure of stables that the early stages of this insect are

Fig. 1.



passed. No one has traced the transformations of this fly in this country, but we copy from Bouché's work on the transformations of insects, the rather rude figures of the larva (Fig. 2), and puparium (*a*) of the *Musca domestica* of Europe, which is supposed to be our species. Bouché states that the larva is cylindrical, rounded posteriorly,

Fig. 2.



smooth and shining, fleshy, and yellowish white, and is four lines long. The puparium is dark reddish brown, and three lines in length. It remains in the pupa state from eight to fourteen days. In Europe it is preyed upon by minute ichneumon flies (*Chalcids*). The flesh-fly, *Musca Cæsar*, or the Bluebottle-fly, feeds upon decaying animal matter. Its larva (Pl. 13, fig. 6) is long cylindrical, the head being pointed, and the body conical, the posterior end being squarely docked. The larva of an allied form which feeds on offal, etc., transforms into a flattened puparium (Pl. 13, fig. 5), provided with long scattered hairs. The House-fly disappears in autumn, at the approach of cold weather, though a few individuals pass through the winter, hibernating in houses, and when the rooms are heated may often be seen flying on the windows. Other species fly early in March, on warm days, having hibernated under leaves, and the bark of trees, moss, etc. An allied species, the *M. vomitoria*, is the Meat-fly. Closely allied are the parasitic species of *Tachina*, which live within the bodies of caterpillars and other insects, and are among the most beneficial of insects, as they prey on thousands of injurious caterpillars. Another fly of this Muscid group, the *Idia Bigoti*, according to Coquerel and Mondiere, produces in the natives of Senegal, hard, red, fluctuating tumors, in which the larva resides.

Many of the smaller Muscids mine leaves, running galleries within the leaf, or burrow in seeds or under the bark of plants. We have often noticed blister-like swellings on the bark of the willow, which are occasioned by a cylindrical

short fleshy larva (Pl. 13, fig. 3 *a*, much enlarged), about .12 of an inch in length, which changes to a pupa within the old larval skin, assuming the form here represented (Pl. 13, fig. 3 *b*), and about the last of June changes to a small black fly (Pl. 13, fig. 3), which Baron Osten Sacken refers doubtfully to the genus *Lonchea*.

The Apple-midge frequently does great mischief to apples after they are gathered. Mr. F. G. Sanborn states that nine tenths of the apple crop in Wrentham, Mass., was destroyed by a fly supposed to be the *Molobrus mali*, or Apple-midge, described by Dr. Fitch. "The eggs were supposed to have been laid in fresh apples, in the holes made by the Coddling-moth (*Carpocapsa pomonella*), whence the larvæ penetrated into all parts of the apple, working small cylindrical burrows about one-sixteenth of an inch in diameter." Mr. W. C. Fish has also sent me, from Sandwich, Mass., specimens of another kind of apple worm, which he writes me has been very common this year in Barnstable county. "It attacks mostly the earlier varieties, seeming to have a particular fondness for the old fashioned Summer, or High-top Sweet. The larvæ (Pl. 13, fig. 2 *a*) enter the apple usually where it has been bored by the Apple-worm (*Carpocapsa*), not uncommonly through the crescent-like puncture of the curculio, and sometimes through the calyx, when it has not been troubled by other insects. Many of them arrive at maturity in August, and the fly soon appears, and successive generations of the maggots follow until cold weather. I have frequently found the pupæ in the bottom of barrels in a cellar in the winter, and the flies appear in the spring. In the early apples, the larvæ work about in every direction. If there are several in an apple, they make it unfit for use. Apples that appear perfectly sound when taken from the tree, will sometimes, if kept, be all alive with them in a few weeks." Baron Osten Sacken informs me that it is a *Drosophila*, "the species of which live in putrescent vegetable matter, especially fruits."

An allied fly is the parent of the cheese maggot. The fly itself, *Piophila casei* (Pl. 13, fig. 1), is black, with metallic green reflections, and the legs are dark and paler at the knee-joints, the middle and hind pair of tarsi being dark honey yellow. The Wine-fly is also a Piophila, and lives the life of a perpetual toper in old wine casks, and partially emptied beer, cider, and wine bottles, where, with its puparium (Pl. 13, fig. 4), it may be found floating dead in its favorite beverage.

We now come to the more degraded forms of Diptera which live parasitically on various animals. We figure, from a specimen in the Museum of the Peabody Academy, the Bird-tick, *Ornithomyia* (Pl. 13, fig. 7), which lives upon the Great Horned Owl. Its body is much flattened, adapted for its life under the feathers, where it gorges itself with the blood of its host.

In the wingless Sheep-tick, *Melophagus ovinus* (Pl. 13, fig. 10, with the puparium on the left), the body is wingless and very hairy, and the proboscis is very long. The young are developed within the body of the parent, until they attain the pupa state, when she deposits the puparium, which is nearly half as large as her abdomen. Other genera are parasitic on bats, among them are the singular spider-like Bat-tick, *Nycteribia* (Pl. 13, fig. 11), which have small bodies and enormous legs, and are either blind, or provided with four simple eyes. They are of small size, being only a line or two in length. Such degraded forms of Diptera are the connecting links between the true six-footed insects and the order of Arachnids (spiders, mites, ticks, etc.). The reader should compare the Nycteribia with the young six-footed moose-tick figured on page 559 of the NATURALIST. Another spider-like fly is the *Chionea valga* (Pl. 13, fig. 12), which is a degraded *Tipula*, the latter genus standing near the head of the sub-order Diptera. The Chionea, according to Harris, lives in its early stages in the ground like many other gnats, and is found early in the spring, sometimes crawling over the snow.

We have also figured and mentioned previously (page 197) the Bee-louse, *Braula*, another wingless spider-like fly.

The Flea is also a wingless fly, and is probably, as has been suggested by an eminent entomologist, as Baron Osten Sacken informs us, a degraded genus of the family to which *Mycetobia* belongs. Its transformations are very unlike those of the fly-ticks, and agree closely with the early stages of *Mycetophila*, one of the Tipulid family. In its adult condition the flea combines the characters of the Diptera, with certain features of the grasshoppers and cock-roaches (Orthoptera), and the bugs (Hemiptera). The body of the human flea (Pl. 13, fig. 13, greatly magnified; *a*, antennæ; *b*, maxillæ, and their palpi, *c*; *d*, mandibles; the latter, with the labium, which is not shown in the figure, forming the acute beak) is much compressed, and there are minute wing-pads, instead of wings, present in some species.

Dr. G. A. Perkins, of Salem, has succeeded in rearing in considerable numbers from the eggs, the larvæ of a flea which lives upon the cat. The larvæ (Pl. 13, fig. 9, much enlarged; *a*, antenna; *b*, the terminal segments of the abdomen), when hatched, are .05 of an inch long. The body is long, cylindrical, and pure white, with thirteen segments exclusive of the head, and provided with rather long hairs. It is very active in its movements, and lives on decaying animal and vegetable matter, remaining on unswept floors of out-houses, or in the straw or bed of the animals they infest. In a few days after leaving the egg the larvæ mature, spin a rude cocoon, and change to pupæ, and the perfect insects appear in about ten days.

A practical point is how to rid dogs of fleas. As a preventive measure, we would suggest the frequent sweeping and cleansing of the floors of their kennels, and renewing the straw or chips composing their beds,—chips being the best material for them to sleep upon. Flea-afflicted dogs should be washed every few days in strong soapsuds, or weak tobacco or petroleum water. A writer in "Science-Gossip"

recommends the "use of the Persian Insect Destroyer, one package of which suffices for a good sized dog. The powder should be well rubbed in all over the skin, or the dog, if small, can be put into a bag previously dusted with the powder; in either case the dog should be washed soon after."

One of the most serious insect torments of the tropics of America is the *Sarcopsylla penetrans*, called by the natives the Jigger, Chigoe, Bicho, Chique, or Pique (Pl. 13, fig. 8, enlarged; *a*, gravid female, natural size). The female, during the dry season, bores into the feet of the natives, the operation requiring but a quarter of an hour, usually penetrating under the nails, and lives there until her body becomes distended with eggs, the hind-body swelling out to the size of a pea; her presence often causes distressing sores. The Chigoe lays about sixty eggs, depositing them in a sort of sac on each side of the external opening of the oviduct. The young develop and feed upon the swollen body of the parent flea until they mature, when they leave the body of their host and escape to the ground. The best preventative is cleanliness and the constant wearing of shoes or slippers when in the house, and of boots when out of doors.

NOTE.—All the figures on Plate 13, except 8 *a*, are enlarged.

A TRIP TO THE GREAT RED PIPESTONE QUARRY.

BY C. A. WHITE, M. D.

THE Great Red Pipestone Quarry, from whence the Indians occupying a large portion of the North American continent have from time immemorial obtained the material for their pipes, has become almost as famous among those who speak the English language as among the aborigines themselves, who, to some extent at least, regard it as a sacred place. This is largely due to the interest which has been